A Dissertation on

ROLE OFACUTE INTERMITTENT PERITONEAL DIALYSIS FOR THE TREATMENT OF ACUTE KIDNEY INJURY

Submitted for

D.M. DEGREE EXAMINATION

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CHENNAI – 600 003

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AIMS OF THE STUDY

1. To identify the patient population who would be most benefited with peritoneal dialysis in AKI .
2. To analyse the factors affecting the outcome of patients with acute renal failure undergoing peritoneal dialysis .

REVIEW OF LITERATURE

The management of patients with acute renal failure (ARF) requires meticulous attention to fluid, acid-base, and electrolyte balance as well as the removal of uremic toxins. Peritoneal dialysis (PD) is an overlooked procedure for dialytic support in acute renal failure, as it is primarily used for the treatment of patients with end-stage renal disease (ESRD). Nevertheless, acute PD remains a viable option for the treatment of selected patients with AKI, particularly those who are hemodynamically compromised or have severe coagulation abnormalities or when other modalities are not readily available [1-3].

The advantages, indications, and contraindications of acute PD and the components of an acute PD prescription will be reviewed here.

ADVANTAGES OF PD — Compared with other available modalities, PD has several advantages as a renal replacement therapy in patients with ARF:

- It is widely available and technically easy to perform.
- Large amounts of fluid can be removed in hemodynamically unstable patients; this fluid removal may also permit the administration of parenteral nutrition.
- Disequilibrium syndrome is not precipitated because of slow solute removal.

- Easy and gradual correction of acid-base and electrolyte imbalance may be performed.
- PD access placement is relatively easy, particularly in children.
- Arterial or venous puncture and anticoagulation are not required.
- It is a highly biocompatible technique.
- Dosing is easy, particularly in children.

Logistics — Acute PD is widely available and can be provided without significant inconvenience in any hospital. The procedure is relatively simple, can be performed by trained intensive care unit (ICU) nursing staff, and is less labor intensive compared to other continuous renal replacement therapies.

Hemodynamic stability — The continuous nature of acute PD involves the slow removal of solutes (eg, urea) and fluid [4]. It is therefore desirable in hemodynamically unstable patients because large amounts of fluid can be removed over a prolonged period of time.

Slow correction of metabolic imbalances — Acute PD enables continuous correction of acid-base status and electrolyte imbalance and the gradual removal of nitrogenous waste products. The slow removal of uremic toxins with acute PD is not associated with the development of the disequilibrium syndrome.

Easy access placement — Acute PD access can be achieved without serious difficulty by inserting a semirigid catheter or by placing a single cuff Tenckhoff catheter. The semirigid catheter insertion can be performed at the bedside by a nephrologist or surgeon. The Tenckhoff catheter is usually placed in the operating room by a surgeon; this flexible catheter is more comfortable for the patient who is moving around in bed and operative insertion avoids the occasional development of intestinal perforation with percutaneous insertion.

Systemic anticoagulation not required — Since the PD procedure does not require systemic anticoagulation, excellent candidates for this modality include the following patients [4]:

- Those with a bleeding diathesis
- Patients in the immediate postoperative period
- Trauma patients
- Patients with intracerebral hemorrhage

This is not an absolute advantage compared to hemodialysis since techniques are available to perform that latter procedure without systemic anticoagulant.

Hyperalimentation — The use of hypertonic glucose PD solutions provides additional calories, which is of benefit in malnourished patients.

Tolerated in children — Acute PD has been frequently utilized and is the preferred form of therapy for dialysis among children with ARF [5,6]. The technique is convenient, relatively simple, and safe to perform in children, particularly since peritoneal access is easily obtained. Acute PD circumvents the need for arterial or venous puncture, both of which are difficult in children.

INDICATIONS — The absolute indication for acute PD is the need for dialysis and the inability to perform any other renal replacement technique. Given the possible advantages of PD in the acute setting, other relative indications in adults include [4]:

- Hemodynamically unstable patients
- The presence of a bleeding diathesis or hemorrhagic conditions
- Difficulty in obtaining blood access
- Removal of high molecular weight toxins (>10 kD)
- Clinically significant hypothermia and hyperthermia
- Heart failure refractory to medical management

CONTRAINDICATIONS — Since there are very few absolute contraindications for acute PD, most of the following conditions are only relative contraindications to this modality [4]:

- Recent abdominal and/or cardiothoracic surgery
- Diaphragmatic peritoneal-pleural connections
- Severe respiratory failure
- Life-threatening hyperkalemia
- Extremely high catabolism
- Severe volume overload in a patient not on a ventilator
- Severe gastroesophageal reflux disease
- Low peritoneal clearances
- Fecal or fungal peritonitis
- Abdominal wall cellulitis
- Acute renal failure in pregnancy

Recent abdominal and/or cardiothoracic surgery — The performance of acute PD may be difficult after abdominal surgery because of the violation of the peritoneal cavity and/or the placement of multiple abdominal drains. Abdominal drains increase the incidence of infection and confound fluid accounting with ongoing PD. The presence of abdominal hernia or intraabdominal adhesions in these patients may also make PD difficult.

In addition, a diaphragmatic pleuroperitoneal communication may be present in patients after cardiothoracic (CT) surgery, thereby resulting in a large pleural effusion if PD is initiated. However, CT surgery patients in whom

the peritoneal cavity is intact and the integrity of the diaphragm is maintained, as well as those who have adequate vital capacity, are good candidates for acute PD.

Respiratory insufficiency — Instilling fluid in the peritoneal cavity may increase intraabdominal pressure. Among patients with respiratory failure, this increase in pressure may compromise lung function (by limiting diaphragmatic excursion), thereby interfering with respiratory exchange.

Severe gastroesophageal reflux disease — Increased intraabdominal pressure may worsen symptoms in patients with severe gastroesophageal reflux disease. If PD is required, such symptoms may be diminished with the placement of patients in body positions that minimize reflux.

Severe hyperkalemia — Since PD does not remove potassium quickly, this modality is less desirable than other renal replacement therapies for the treatment of life-threatening hyperkalemia not responding to medical measures [7]. However, PD is still useful in the management of less severe hyperkalemia. In addition to the gradual removal of potassium, PD may also enhance the intracellular movement of potassium by generating bicarbonate and stimulating insulin production (via the administration of intraperitoneal glucose).

Severe volume overload — Since fluid removal is relatively limited with PD, patients with severe fluid overload may not be the best candidates for the modality. The rate of ultrafiltration in PD is dependent upon multiple factors, including the hypertonicity of the glucose solution; as a result, titration of fluid removal is not as easily achieved as it is with hemodialysis.

Nevertheless, rapid volume removal is possible using high glucose concentrations and rapid exchanges. Patients with severe volume overload who are not supported by a ventilator probably should not be treated with PD.

Hypercatabolic patient — Since acute PD is limited with respect to the rate of solute removal, severely hypercatabolic patients may be offered an alternate renal replacement therapy [8].

ARF in pregnancy — Pregnant women with ARF are potentially good candidates for acute PD therapy because of the hemodynamic stability associated with the technique. However, there is a paucity of literature related to this issue. For obvious reasons, acute semirigid PD catheters should be avoided in this setting, and permanent PD catheters should be placed under direct visualization.

TECHNIQUES — Acute PD can be performed intermittently or continuously (depending upon the desired amount of fluid and solute removal) and either manually or via an automated device [9].

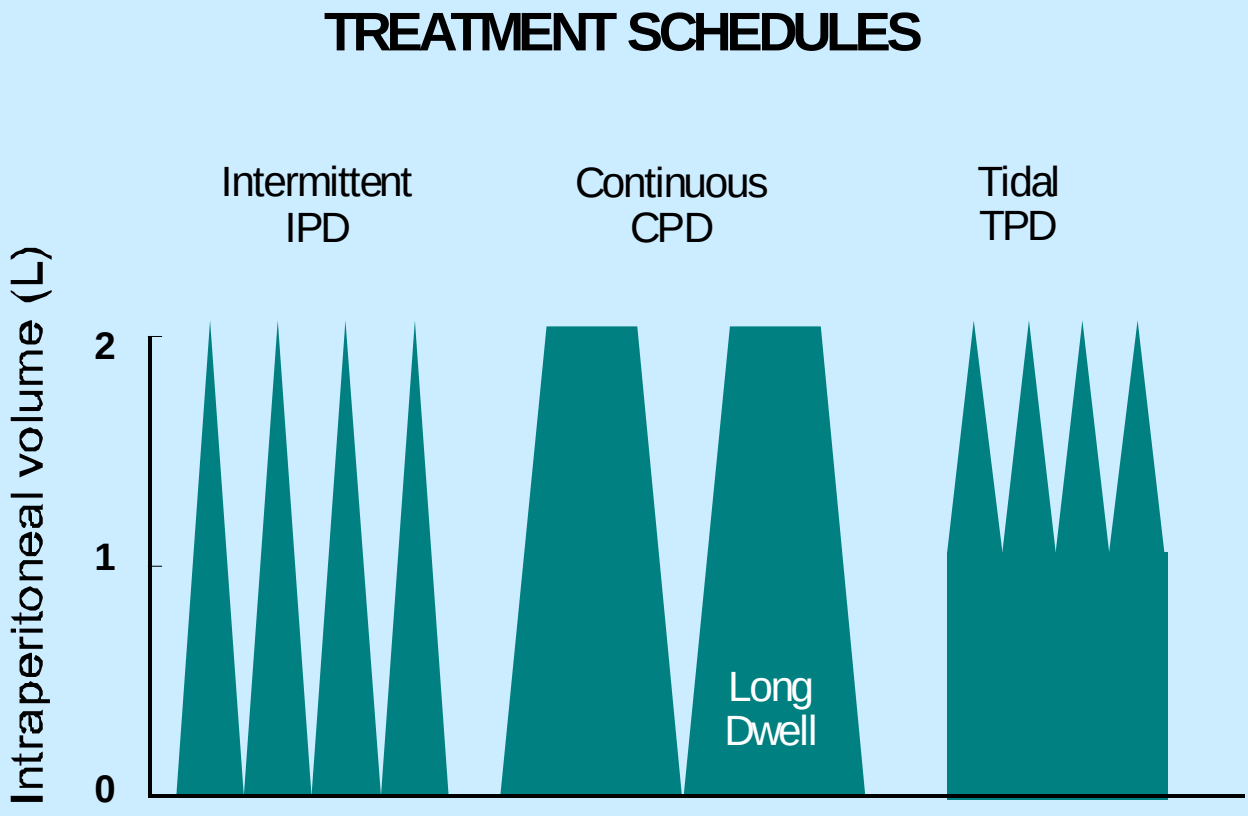
Acute manual PD is usually performed by nurses, since it requires constant supervision to ensure proper inflow and accurate dwell and drain times. Nursing assistance is also required for the maintenance of a record of exchange and drain volumes, and the documentation of net ultrafiltration.

By comparison, the use of the automated device or cycler reduces the need for constant nursing supervision. The number of interruptions are significantly decreased, since large volumes of solutions can be prepared at the beginning of the procedure.

Acute intermittent peritoneal dialysis — This technique can either be performed manually or can be delivered by an automated cycling device. The prescription usually involves short dwell times with 2.0 to 3.0 liter dialysate volumes.

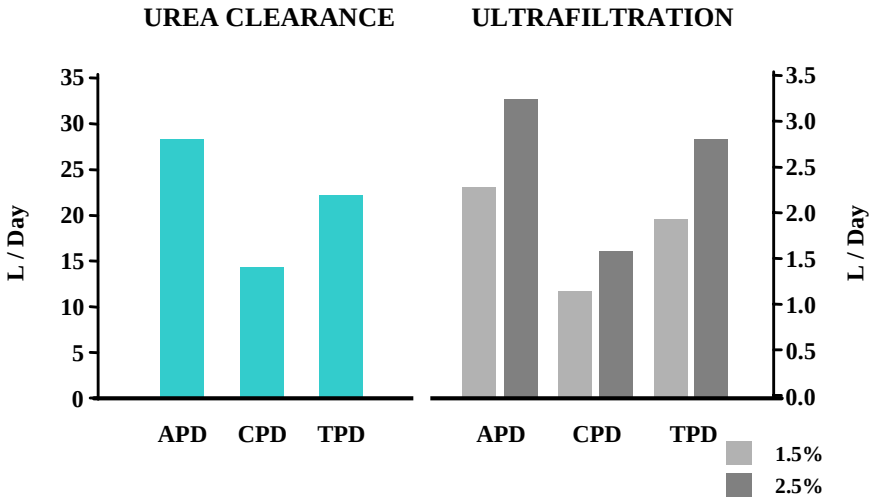
Chronic equilibrated peritoneal dialysis — Chronic equilibrated peritoneal dialysis (CEPD) is similar to chronic ambulatory peritoneal dialysis except that CEPD is performed in patients who are not ambulatory. This technique maintains a fairly stable fluid and solute balance and can be performed manually approximately four times daily with dwell times of four to six hours. CEPD can also be performed using an automated machine [10-12] that provides reliable and timed exchanges, thereby eliminating the need for interruptions or breaks in the sterile technique. CEPD dosing can be adjusted based upon the amount of fluid or nitrogenous wastes that have to be removed.

Tidal peritoneal dialysis — Tidal peritoneal dialysis (TPD) is a form of PD prescription that leaves a constant 'tidal' volume of 1.0 to 1.5 liters in the peritoneal cavity after the peritoneum is filled with a large (3.0 liter) dialysate volume. This allows for rapid exchange, using a cycler, of approximately half the peritoneal fluid instilled, thereby improving overall solute clearance [2,13].



TECHNIQUES OF ACUTE PERITONEAL DIALYSIS

ULTRAFILTERATION AND SOLUTE CLEARANCES OF DIFFERENT TECHNIQUES OF ACUTE PD



Peritoneal access — One of the important determinants of a successful acute PD procedure is a reliable peritoneal access [9]. Peritoneal access can easily be obtained by inserting a semirigid acute catheter or a single cuff Tenckhoff catheter. Each has advantages and disadvantages.

Semirigid acute catheter — The main advantage of a semirigid acute PD catheter is that it can be placed relatively easily at the bedside by a nephrologist, without the help of a surgeon [16]. Since it is usually

performed under local anesthesia, the potential risks of general anesthesia are avoided in the critically ill and unstable patient.

However, there are several disadvantages to the use of semirigid catheters. The most important is the enhanced risk of infection because acute catheters do not have cuffs that protect against bacterial migration. The incidence of peritonitis is high, particularly if the catheter is left in place for more than 72 hours [16,17]. There is also a risk of bowel perforation both at the time of insertion and with increased length of time of placement. Thus, these catheters must be removed within 72 hours. They are also uncomfortable for the alert patient.

Cuffed permanent catheter —

Placement of a cuffed permanent catheter in ARF patients has several advantages [1,9,18,19]:

- A good immediate functioning catheter is almost assured.
- The overall incidence of infection is decreased.
- The need for repeated punctures for intermittent dialysis is obviated; such punctures are occasionally required with the acute semirigid catheter since the course of ARF and the number of PD treatments is very unpredictable.
- These soft catheters pose minimal risk to the bowel or other intraperitoneal organs and are more comfortable for the patient.

- These catheters are preferable in acute PD patients on cyclers, since acute semirigid catheters can sometimes trigger cycler alarms, leading to frequent interruptions of dialysis.

These advantages must be carefully weighed against the potential risks, which include complications and morbidity associated with a surgical procedure (if not inserted at the bedside by a percutaneous technique), the risks of general anesthesia, and overall stability of the patients, particularly those in the intensive care unit.

COMPONENTS OF ACUTE PERITONEAL DIALYSIS

PRESCRIPTION — The standard acute PD prescription includes the following components:

- Length of the dialysis session
- Dialysate composition
- Exchange volume
- Inflow and outflow (drain) periods
- Dwell time
- Number of exchanges
- Dialysate additives
- Monitoring fluid balance

Length of dialysis session — The total length of an acute PD session averages about 24 to 72 hours since a session usually consists of 24 to 72 exchanges, each of which lasts approximately one hour [17]. Nevertheless, the length of the PD session can vary significantly since it is dependent upon the cause and duration of ARF, the amount of solute and fluid removal that is desired, and the risk of infection, particularly with rigid catheters.

To accommodate the unpredictable course of ARF and the overall condition of these critically unstable patients, acute PD orders should only be written for a period of 24 hours. Periodic adjustments may need to be made based upon the patient evaluation and laboratory parameters, which should be performed at least daily.

Dialysate composition — PD dialysate is available in standard hydrous dextrose concentrations of 1.5, 2.5, and 4.25 percent. Dialysate solutions should be warmed to body temperature prior to infusion to avoid discomfort and enhance solute transport.

To obtain better ultrafiltration, it is reasonable to initiate acute PD in most patients with the 2.5 percent dialysate solution. An initial dialysis solution dextrose concentration of 1.5 percent may be more appropriate in patients with only moderate amounts of fluid overload and in those who are hemodynamically unstable.

Dialysis solutions with higher dextrose concentration can be substituted based upon the amount of fluid removed and the patient's hemodynamic parameters. With a standard regimen, such as a two liter exchange volume and one hour dwell time, the following average amounts of fluid can be removed over a 24 hour period:

- 2.5 liters with 1.5 percent dextrose
- 4.5 liters with 2.5 percent dextrose
- 8.5 liters with 4.25 percent dextrose

The most practical way to achieve adequate fluid removal is by mixing and matching low and high dextrose concentration solutions. Once the patient is euvolemic, the dialysis solution should be switched to a dextrose concentration of 1.5 percent and the rate of exchange slowed.

Exchange volume — The exchange volume is the amount of dialysate solution instilled into the peritoneal cavity during an exchange. Factors affecting this volume include the peritoneal cavity size, the presence of pulmonary disease and/or hernia(s), and the desire to limit leakage of dialysate.

Peritoneal cavity size — The area of the peritoneal cavity, which can be estimated by the size of the patient, is the most important determinant of exchange volume.

An average 50 to 60 kg adult can tolerate 1.5 liter exchanges without much difficulty. Smaller patients may require smaller exchange volumes, while exchange volumes of 2 to 2.5 liters may be utilized to improve dialysis efficiency in larger patients with no obvious contraindicated .

Respiratory insufficiency — Patients with pulmonary diseases, such as pneumonia, chronic obstructive/restrictive lung disease and respiratory failure requiring ventillatory support, may require smaller exchange volumes to prevent compromise of diaphragmatic excursions and respiration.

Hernias — In patients with abdominal wall or inguinal hernias, the exchange volume must be reduced to limit the increase in intra-abdominal pressure.

Leakage — Most clinicians keep the exchange volume low for the first day to avoid leaks from the new catheter insertion site. The dialysate volume can then be gradually increased over the ensuing three to four days as tolerated by the patient.

Inflow time — Inflow time is the time required to instill the dialysate into the peritoneal cavity, a process usually driven by gravity. Inflow usually takes approximately 10 to 15 minutes [9]. Factors that determine the inflow time include:

- The dialysate volume
- Degree of elevation of the dialysate bag above the patient's abdomen

- The presence of absence inflow resistance resulting from kinking of the peritoneal catheter or from reduced bowel motility

To maximize the efficiency of dialysis, it is imperative to keep the inflow time to a minimum.

Dwell time — The dwell time is the period in which the exchange volume remains in the peritoneal cavity, or the time between the end of inflow to the beginning of the drain period.

The dwell time for standard acute PD is approximately 30 minutes, the time at which the gradients favoring urea and fluid removal are most favorable [9]. A dwell time of less than 30 minutes is usually not adequate [20].

Outflow time — Outflow time is the time required to drain the effluent dialysate from the peritoneal cavity. The outflow of the dialysate is controlled by gravity and usually takes about 20 to 30 minutes [9]. Some of the major determinants of the outflow time include:

- Volume of the dialysate effluent to be drained
- Outflow resistance, which results from kinks in the catheter, decreased bowel motility, and fibrin in the dialysate
- The height difference between the patient and the drainage bag

As with the inflow time, it is important to keep the outflow time to a minimum. This can be done by adjusting the height of the drainage bag.

It is extremely important to ensure complete drainage since incomplete drainage can result in progressive accumulation of dialysate in the peritoneal cavity, leading to respiratory embarrassment and/or abdominal discomfort. The PD orders should specify to "continue outflow until drainage stops" to avoid incomplete drainage.

Number of exchanges — The number of exchanges is usually determined by the amount of fluid and solute removal required in a particular patient. Although it may vary, the usual number of exchanges is about 24 per day with standard acute PD and approximately four to six per day with CEPD.

Dialysis solution additives — Drugs can be added to the dialysis solution to treat specific conditions. It is imperative to follow sterile technique when adding additives into dialysate solutions. Some of the commonly used dialysate additives are heparin , insulin, and potassium.

Heparin — Heparin is usually added to dialysate solutions at a dose of 200 to 500 units per liter to prevent fibrin clot formation, which can obstruct the peritoneal catheter [17]. Although it is usually added when plugs or strands of fibrin are visible in the drained fluid, heparin is more beneficial when added prophylactically. Once outflow obstruction is established, there is usually a poor response to heparin. Since heparin is not absorbed through the peritoneum, intraperitoneal heparin does not produce systemic anticoagulation.

Insulin — Insulin is commonly administered intraperitoneally in diabetic patients on PD. The use of hypertonic dextrose-containing dialysate solutions in diabetics results in a significant glucose load; this burden can result in uncontrolled blood glucose levels if not managed with appropriate insulin dosing. Intraperitoneal insulin is usually added to the dialysate solutions and adjusted based upon frequent blood glucose monitoring (approximately every six hours). One simple algorithm consists of an increasing insulin dose to be administered in the dialysis bag with increasing dextrose concentration [17]:

- 4 to 5 units/L for 1.5 percent dextrose
- 5 to 7 units/L for 2.5 percent dextrose
- 7 to 10 units/L for 4.5 percent dextrose

Potassium — Since standard PD solutions do not contain any potassium, potassium chloride should be added to the dialysate (usually 3 to 4 mmol/L) in hypokalemic patients. In patients with cardiac disease, particularly if treated with digoxin, the serum potassium should be closely monitored and the intraperitoneal potassium added to the dialysate to maintain the serum potassium at about 4 meq/L [17].

Monitoring fluid balance — It is essential to maintain accurate flow sheets, monitor intake and output records, and document net ultrafiltration in patients on acute PD. Daily intake and output charting and weights need to be incorporated into acute PD orders.

COMPLICATIONS — Acute PD is associated with complications, some of which are serious and potentially life-threatening [21,22]. Many are preventable. A brief listing of these complications is found in this section.

Peritonitis is most common complication associated with PD . It is diagnosed by presence of more than 100 cells/mm3 in dialysate with more than 50 % of them being neutrophils . Patients may complain of abdominal pain , fever , diarrhea or vomiting or the peritoneal fluid effluent may be cloudy . Peritonitis complicates acute PD in up to 12% of cases, frequently developing within the first 48 hours .Because the major source of infection and of subsequent peritonitis is contamination during connection or disconnection of each new exchange, infection is more common with open-drainage systems(42)

Mechanical complications — Most of the mechanical complications are not a serious threat to life, but may result in reduced dialysis efficiency. These include the following:

Abdominal pain or discomfort — Mild abdominal pain or discomfort is common and is usually secondary to abdominal distention. By comparison, moderate to severe pain may be due to a catheter-related complication and warrants investigation. Marked pain on inflow of dialysis solution may be a

result of the solution's low pH, its low temperature, the "jet flow" from a straight catheter tip, or distension of the tissue around the catheter.

This pain may be relieved by alkalinization of the solution with sodium bicarbonate (5 – 25 mEq/L), by warming the solution, and by choosing a lower infusion rate. Localized outflow pain associated with drainage may indicate that the omentum or other tissues have trapped the catheter(42)

Intraabdominal hemorrhage — Mild bleeding is frequent and can be observed with catheter placement. However, severe intraabdominal hemorrhage has been reported from catheters, particularly semirigid acute catheters. Bloody dialysate, which is frequently seen after catheter insertion, is usually a result of the lysis of peritoneal adhesions from a previous abdominal operation or of peritoneal irritation. The presence of a bleeding tendency predisposes to this complication.

Leakage — Leakage around the PD catheter site is a common occurrence, which can be managed by reducing the exchange volume for the first 24 hours. In some cases, temporary cessation of PD may be necessary. Early dialysate leakage may be seen in the presence of predisposing factors such as age over 60 years, obesity, diabetes mellitus, chronic use of steroids, multiparity, and a previous abdominal operation.

Abdominal wall and genital edema have been attributed to peritoneal defects at the site of catheter insertion. Abdominal-wall edema should be suspected in cases of a sudden reduction in effluent volume and

increased abdominal girth and body weight in the absence of edema elsewhere .

Inadequate drainage :

Inadequate drainage is usually due to decreased bowel motility. Administration of bowel cathartics will improve drainage in most situations, while manipulation of the catheter may occasionally be necessary.At times the omentum or peritoneum can occlude the outflow in the peritoneal catheter and contribute to inadequate drainage .

Bowel perforation :

Bowel perforations may be observed, particularly with the placement of semirigid acute PD catheters. Patients may have severe abdominal pain, blood-tinged peritoneal effluent, intraabdominal hemorrhage, and (rarely) shock. Therapy consists of the cessation of acute PD treatments, catheter removal, intravenous antibiotics, and bowel repair.

Infectious complications :

Infectious complications are common, particularly peritonitis. The incidence of peritonitis can be significantly decreased by maintaining sterile precautions during the placement of acute PD catheters and by preventing contamination during exchanges. In addition, a puncture site abscess can result from the bedside placement of acute PD catheters, particularly if meticulous attention is not given to sterile technique

Pulmonary complications

Basal atelectasis and pneumonia :

Atelectasis and pneumonia can result from the increase in intraabdominal pressure associated with acute PD treatments.

Pleural effusion :

Migration of fluid into the thoracic cavity, hydrothorax, can occur via a defect in the diaphragm or diaphragmatic lymphatics. A right sided effusion is most common. Decreasing intra-abdominal pressure by lowering exchange volumes and performing acute PD in a supine position may help in most situations. Pleurodesis is rarely required.

Aspiration :

Increased intraabdominal aspiration may result in the aspiration of gastric contents, the incidence of which may be reduced with the use of a lower exchange volume.

Cardiovascular complications

Hypovolemia :

Excessive ultrafiltration [23] or diaphragmatic elevation secondary to increased intra-abdominal pressure (resulting in decreased venous return) can reduce effective tissue perfusion.

Cardiac arrhythmias :

Cardiac arrhythmias are common, due most frequently to electrolyte and metabolic disturbances, or diaphragmatic elevation.

Metabolic complications :

Metabolic complications are common and often preventable complications of acute PD:

Hyperglycemia : Hyperglycemia can result from the high glucose concentration of the PD fluid.

Hypoglycemia : Hypoglycemia may occur following the cessation of PD.

Hypernatremia :

Hypernatremia can be induced by the disproportionate loss of free water in the PD fluid when hypertonic exchanges are repeatedly used. Since aquaporin 1 water channels in peritoneal capillaries are activated by the glucose-generated tonicity of the dialysate, free water moves down these channels. Sodium will then diffuse down its diffusion gradient from blood to dialysate through the small intercellular pores. However, if the exchange is short in duration, there may be inadequate time for sodium diffusion to occur and the patient slowly becomes hypernatremic. This is best corrected by lengthening the duration of the exchanges so that diffusion can occur and/or using less hypertonic dialysate.

Hypokalemia :

As previously mentioned, hypokalemia may ensue because standard PD solutions do not contain any potassium. This can be corrected by adding potassium to the dialysate.

Protein losses :

Protein losses occur in the dialysate, occasionally exceeding 5 g/day.

TRIALS FOR OUTCOME OF ACUTE KIDNEY INJURY WITH PERITONEAL DIALYSIS

Value of Intermittent Peritoneal Dialysis in rural setup :
245 patients who had undergone PD in Thanjavur Medical College Hospital because of ARF (108 snakebite cases, 45 acute diarrhoeal disease cases, 15 obstetric renal failure patients, and 31 miscellaneous cases) They concluded that PD is a valuable procedure in ARF patients and that training the interns can allow them to manage ARF earlier in primary care centers and this would save most of the patients and help to decrease the mortality due to ARF.

Edwin Fernando M , Venu G , Jayakumar M Low Incidence Of Acute Peritonitis In Intermittent Peritoneal Dialysis - An Experience From A Tertiary Care Unit Published in the Journal Of The Peritoneal Dialysis Society Of India . 162 patients with AKI and 901 patients with CKD

underwent PD in this study . 16 out of 162 patients developed infectious peritonitis and the incidence of peritonitis wes lower than that of those with CKD . Klebsiella (36%) , Staph. Aureus(31%) ,pseudomonas , E.Coli , and microccci were the commonest organisms (42). Aminoglycosides was found to be sensitive antibiotic for about 86% of patients .

Sridhar , Muthusethupathy , Shankar et.al had published an article in JAPI 1991 comparing the efficacy of acute intermittent peritoneal dialysis and intermittent hemodialysis in the management of patients with ARF due to acute diarrheal illness . This study concluded that peritoneal dialysis was a superior form of dialytic therapy compared to HD in patients with ADD as cause of AKI and that metabolic acidosis was the most important factor on multivariate analysis to be associated with a poor outcome in these patients .(43)

Part of the reason for the underuse of PD may be related to the perception that PD is not adequate for the treatment of ARF. How valid is this assumption? With respect to the concern that PD cannot control the uremia of acutely ill ARF patients because of the lower daily solute clearances with PD than with daily HD (16), most studies that have evaluated PD in hypercatabolic ARF reported that this mode of dialysis gave satisfactory control of fluid and metabolic derangements (26 - 31). However, major limitations of these studies were the lack of accurate measurements of dialysis adequacy and the lack of accurate measurements of catabolic status.

Chitalia et al evaluated the adequacy of PD in ARF using accepted standards adequacy indices (Kt/V, normalized creatinine clearances) (42)and published his data in an article :"PD for hypercatabolic renal failure in developing countries". 87 ARF patients with mild to moderate hypercatabolic ARF were included .He found that CPD fell just short of the adequacy standard. TPD provides better clearances at the same dialysis volume at lower in-patient cost for those with ARF . Higher protein loss was the only limitation to TPD use in ARF.

To evaluate the adequacy of PD in ARF using accepted standards, Khanna's team did a prospective, randomized crossover trial (32) in 87 ARF patients with mild-to-moderate hypercatabolic ARF. In this trial they analyzed the solute reduction indices (SRI) of both tidal PD and continuous equilibration peritoneal dialysis (CPD). Comparing adequacy indices (Kt/V, normalized creatinine clearances, SRI dialysate, SRI Kt/V), they showed that both tidal PD and CPD are reasonable options for mild-to-moderate hypercatabolic ARF, even though CPD fell just short of the adequacy standard. Tidal PD provides better clearances at the same dialysis volume at a lower inpatient cost for patients with ARF. Therefore, they concluded that, in developing centers that have access to cyclers to enable more rapid dialysis, the use of PD should be encouraged for the treatment of hypercatabolic ARF.

However, a more recent trial, conducted in Vietnam, offered a different conclusion. Phu et al. (33) compared acute PD with pumped venovenous hemofiltration randomly performed in 70 adult patients with infection-associated ARF (falciparum malaria or sepsis). They concluded that hemofiltration was more effective in bringing about resolution of acidosis and lowering plasma creatinine levels — both of these effects were accompanied by a marked increase in survival. The group assigned to PD had a markedly increased risk of death (odds ratio 5.1, 95% confidence interval 1.6 – 16). However, these authors did not say how they compared the adequacy of solute removal between the two techniques. In that study, 42% of the PD patients had cloudy dialysate (an indication of possible infection). However, peritonitis was confirmed in only one patient — the only one treated for it. It is of interest to note that the same group had earlier reported a dramatic reduction in mortality in malaria-associated renal failure with the sole use of PD; the difference in case mix could perhaps account for this (34). It is therefore possible that, if careful attention is paid to the details of peritoneal access and to dialysis prescription (tidal versus equilibration), results equivalent to those obtained with HD may be achieved in ARF treated by PD.

Continuous peritoneal dialysis was compared with daily hemodialysis in patients with acute kidney injury by Daniela Ponce Gabriel , Jacqueline Teixeira Caramori, Luis Cuadrado Martin, Pasqual Barretti and Andre Luis Balbi in The Department of Internal Medicine, University

Hospital, Brazil . A total of 120 patients with acute tubular necrosis (ATN) were assigned to receive CPD or daily HD in a tertiary-care university hospital. The primary endpoint was hospital survival rate; renal function recovery and metabolic, acid–base, and fluid controls were secondary endpoints . Of the 120 patients, 60 were treated with CPD (G1) and 60 with daily HD . The two groups were similar in metabolic and acid–base control (after 4 sessions, BUN < 55 mg/dL: 46 ± 18.7 mg/dL vs 52 ± 18.2 mg/dL; pH: 7.41 vs 7.38; bicarbonate: 22.8 ± 8.9 mEq/L vs 22.2 ± 7.1 mEq/L in group 1 and 2 respectively). Duration of therapy was longer in G2 (5.5 days vs 7.5 days; p = 0.02). Despite the delivery of different dialysis methods and doses, the survival rate did not differ between the groups (58% in G1 vs 52% in G2), and recovery of renal function was similar (28% vs 26%). The authors concluded that high doses of CPD provided appropriate metabolic and pH control, with a rate of survival and recovery of renal function similar to that seen with dHD. Therefore, CPD can be considered an alternative to other forms of RRT in AKI

S.R. Ash had published an article titled " Which Treatment for ARF in ICU?" in Contributions to Nephrology 2001. According to this author Peritoneal Dialysis for acute renal failure of adults is a safe, effective, and low-cost modality of treatment .This study was done in Greater Lafayette Health Systems (GLHS) and Arnett Clinic; Purdue University and HemoCleanse, Inc., West Lafayette, Ind., USA . He envisages the perfect device for continuous arteriovenous hemofiltration and dialysis (CAVHD) for patients with acute renal failure (ARF). This'far-out' ideal device would

provide: (a) permeability to uremic toxins and limited passage of albumin and tightly bound toxins (b) infallible blood access with blood flow rate of about 200 ml/min (c) controllable ultrafiltration rate; (d) biocompatibility of blood pathways, (e)obviating need for anticoagulants; (f) impermeability to bacteria in dialysate, preventing septicemia after dialysate contamination; (g) permeability to white cells into dialysate if there is bacterial contamination, to limit proliferation and provide a visible sign of the contamination; (h) passage of effluent blood from the membranes directly to the liver, allowing metabolic conversion of lactate, glucose or various nutrients, and (i) ease of use, allowing continuous 24-hour dialysis by merely intermittently infusing and draining modest volumes of sterile dialysate through a permanent access. Most of these advantages are present in PD compared to CRRT / intermittent HD.

The author proposes that internal CAVHD system already exists in all patients and can be used without paying any royalty. It is the peritoneum. Like all dialysis procedures, peritoneal dialysis (PD) was first used in therapy of ARF . Now CAPD or cycler therapy supports about 15% of patients with ESRD in the USA . The success of CAPD in support of patients with ESRD has reminded physicians that PD can also be used for treatment of ARF in adults. In some countries such as Japan, PD was a more common choice for treatment of ARF in adults than CAVH in 1980's . So the author says that in ARF, PD should be chosen for the same types of patients as those who require CRRT . Ash drew similar this conclusion after reviewing several studies, including his own (35).

Although PD may be equivalent to HD in ARF, is it better than HD in any particular situation? The evidence for this is not solid. Several reports do suggest that a patient with ARF secondary to atheroembolic renal disease may have a better chance of recovery if PD is used over HD (36 , 37). Its advocates have advanced several reasons, including the absence of sudden hemodynamic changes in PD as opposed to HD, and the avoidance of anticoagulation (which could therefore decrease the chances of further atheroembolism).Although attractive as a hypothesis, this assertion awaits formal testing in a clinical trial comparing these two modalities.

Furthermore, Katz et al.(38) report a beneficial role of PD in recovery of renal function when PD was the primary form of dialysis in patients with renal failure due to malignant hypertension. These workers all reported that blood pressure control, kidney size, and initial values of mean arterial pressure, serum creatinine, and urine output were predictors of outcome.

Peritoneal dialysis has also been found to be useful in patients with AKI due to acute pancreatitis in anecdotal reports . The proposed mechanism of benefit is the washout of inflammatory mediators from the peritoneal cavity due to pancreatic inflammation . But a randomized study (42) failed to show any difference in outcome in this group of patients among different modes of dialytic therapy which included PD .

Peritoneal Dialysis International, Vol. 23, pp. 320–322 2003
Dimitrios G. Oreopoulos3, Panduranga Rao1, Ploumis Passadakis2,

It might be apparent that factors beyond efficacy have dictated the decline in the use of PD for ARF. The importance of these factors should not be underestimated. They might be related to the perceived “labor intensive” aspect of PD, fear of a malfunctioning catheter (which in some instances may be real), insufficient exposure to PD during nephrology training, and, last, the comfort offered by the technology used for HD. Such psychological barriers are difficult to overcome, much more so than technical barriers (which can be and have been overcome). Only a concentrated effort by the PD community in educating the general nephrologist concerning the feasibility of PD in ARF, better clinical trials that harness the full potential of PD, and careful patient selection for the use of PD will bring PD back to the mainstream in the treatment of ARF.

MATERIALS AND METHODS :

SETTING :

The study – " Peritoneal dialysis in patients with acute kidney injury " was carried out in the Department of Nephrology , Madras medical college and Govt. General Hospital, Chennai .

PERIOD OF STUDY :

1st March 2007 to 30th November 2008.

DESIGN OF STUDY :

Prospective study of consecutive patients with acute kidney injury who underwent peritoneal dialysis in Govt. General Hospital , Chennai .

SAMPLE SIZE :

151 patients who underwent peritoneal dialysis for acute kidney injury were included in this study . Indications for initiation of PD included volume overload, hyperkalemia refractory to medical treatment, metabolic acidosis , symptomatic uremia (pericarditis, encephalopathy, bleeding dyscrasia, nausea, vomiting).

SELECTION OF PATIENTS :

All patients with acute kidney injury who underwent peritoneal dialysis were included in this study . Patients with acute kidney injury underwent Peritoneal dialysis initially unless they had

- Recent abdominal and/or cardiothoracic surgery
- Severe respiratory failure
- Life-threatening hyperkalemia
- Extremely high catabolism
- Severe volume overload in a patient not on a ventilator
- peritonitis due to surgical causes
- Abdominal wall cellulitis
- Acute renal failure in pregnancy
- Diaphragmatic peritoneal-pleural connections

The following patients were taken up for peritoneal dialysis even if they had few of above conditions if they had

- Refractory hypotension despite use of pressor agents
- Requiring ventillatory support with AKI

Patients were transferred to Intermittent hemodialysis if they had

- Persistent renal failure despite 2 peritoneal dialysis sessions
- Persistent renal failure requiring dialysis more than 6 days after institution of peritoneal dialysis
- Raising blood urea and creatinine levels following peritoneal dialysis compared to prior levels
- Persistent hyperkalemia despite peritoneal dialysis
- Persistent uremic symptoms despite peritoneal dialysis

PROCEDURE OF INTERMITENT PERITONEAL DIALYSIS :

IPD was done using Polyurethane IPD catheter(Dimensions: 280 x 5 x 3.5mm, B Braun, Melsungen AG, Germany) and IPD Y Transfer set(B Braun, Melsungen AG, Germany).Constituents of IPD fluid (1L bottles, Parenteral Drugs India, Ltd) is given below .

CONSTITUENTS & COMPOSITION OF IPD FLUID

CONSTITUENT	CONCENTRATION
Sodium	130mmol/L
Calcium	1.5mmol/L
Magnesium	0.75mmol/L
Chloride	100 mmol/L
Acetate	35 mmol/L
Dextrose Anhydrous	1.7 gm/100 ml

The PH of the fluid was adjusted with hydrochloric acid to 5.8 and the calculated osmolality was 368. The following additives were used in the IPD bottles - Inj. Heparin (unfractionated) 250 U/L,Inj.Pottasium Chloride 2mEq/L and in select cases where fluid removal had to be quicker and more, Inj. 25% Dextrose 100cc /L was added to the peritoneal dialysis solution . IPD was carried out in a sterile room with strict aseptic precautions. Each session consisted of 24 exchanges, each exchange lasted an hour. The time taken for the inflow was 10-15 minutes, Dwell time was 30 minutes and time taken for outflow was 15-20 minutes. The volume of fluid during each exchange ranged from 1.5-2 L depending on the body weight(40ml//kg)

METHODS :

All patients with acute kidney injury undergoing peritoneal dialysis were evaluated by complete medical history , systemic examination ,standardized blood tests and imaging studies and were recorded in a standardized sheet .

Clinical history and records regarding the cause of renal failure , diabetic or hypertensive status and drugs the patient had taken were obtained .

Clinical examination regarding the volume status , need for pressor agents , evidence of other organ failure – jaundice , encephalopathy , respiratory distress , need for ventillatory support were recorded .

Appropriate investigations for cause of renal failure , evidence of other organ dysfunction , and radiologic investigations as required were done .

The primary outcomes were - recovery from renal failure , patient transferred to hemodialysis or patient mortality . The last two outcomes were analysed as failure of peritoneal dialysis. Factors analysed for the outcomes were : age , sex , comobidities like – diabetis mellitus or hypertension or CCF , volume status at initiation of peritoneal dialysis ,presence of hypotension and its response to pressors or intravenous fluids , metabolic acidosis , hyperkalemia , serum creatinine at initiation of PD , urine output , hypercatabolism , coma , jaundice , raised liver enzymes , need for ventillatory support , presence of DIC or thrombocytopenia ,fluid removal with PD , percentage fall in urea or serum creatinine values , peritonitis due to PD .

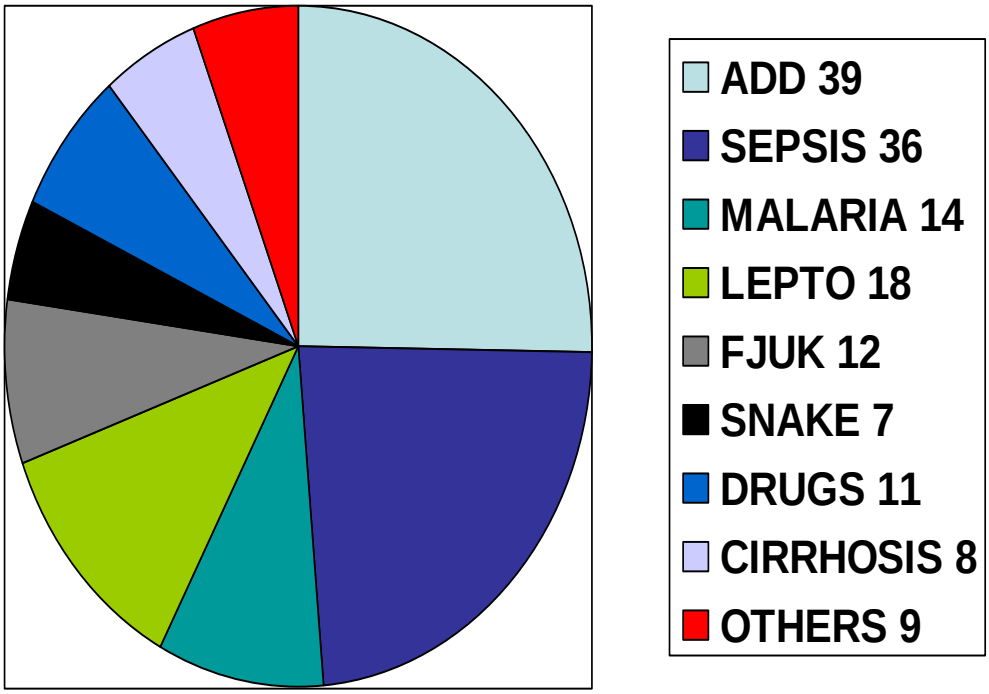
STATISTICAL ANALYSIS :

Variables which were analyzed as qualitative data included sex , presence of co morbid illness like DM , HT , CCF , presence of hypovolemia , pedal edema , metabolic acidosis , hyperkalemia , oliguria , hypercatabolic renal failure , coma , jaundice , raised LFT enzyme levels , unresponsive hypotension , need for ventillatory support , DIC , thrombocytopenia . Qualitative data are given in frequencies with their percentages .

Quantitative data were age, urine output per day , serum creatinine .Quantitative data are given in mean and standard deviation . Quantitative data were analyzed using student independent t test . Qualitative data were analyzed using Fischer's exact probability test and quantitative data were analyzed using independent – t – test .
P value less than 0.05 were taken as significant. Multivariate analysis was done using logistic regression analysis . SPSS software was used for statistical analysis .

OBSERVATIONS :

The total number of patients who underwent PD in our study was 151 . The distribution of patients according to their etiology of renal failure is depicted below .

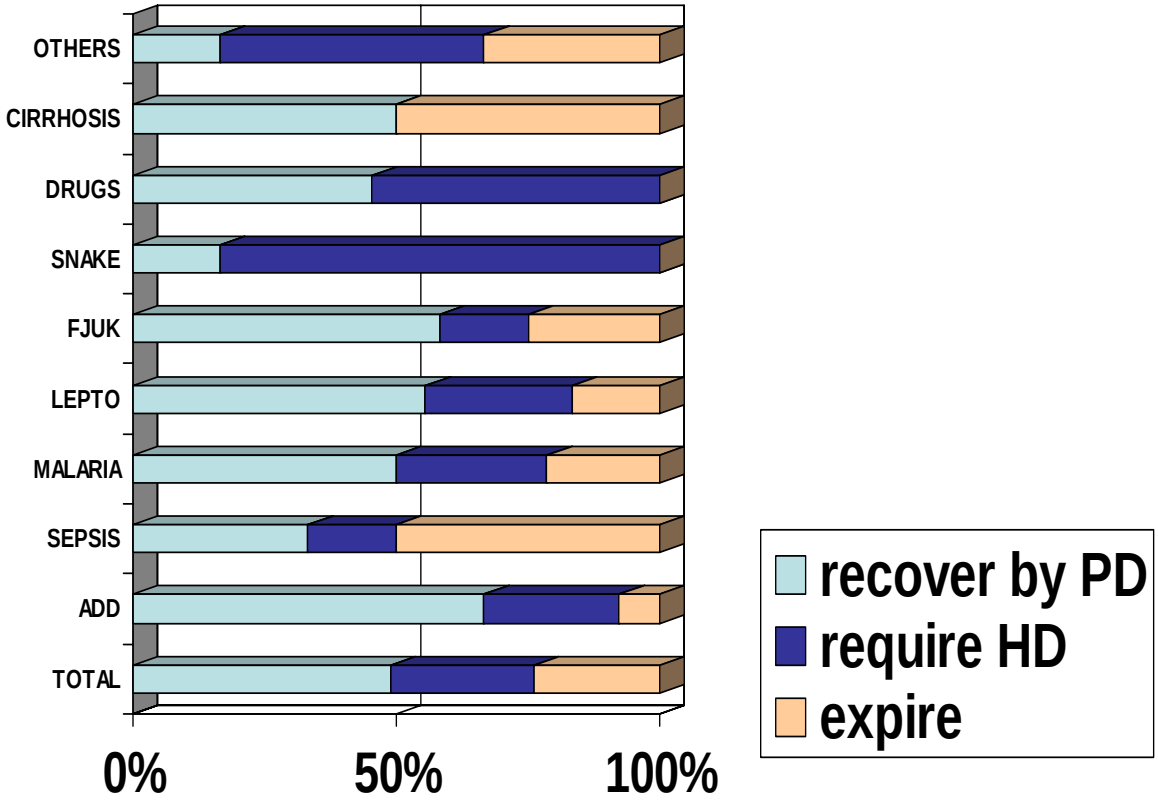


ADD- Acute diarrheal illness
FJUK- febrile illness with jaundice and kidney failure of unkown cause

DISTRIBUTION OF PATIENTS ACCORDING TO ETIOLOGY OF RENAL FAILURE

DISTRIBUTION OF PATIENTS ACCORDING TO THEIR OUTCOME

The distribution of patients according to their outcome : patients who recovered with peritoneal dialysis ; patients who required hemodialysis foe renal failure ; patients who expired is depicted below .



DISTRIBUTION OF PATIENTS ACCORDING TO THEIR OUTCOME

	Total	death	Required HD	Recover with PD	P value
ADD	39	3	10	26	.014
SEPSIS	36	18	6	12	.001
MALARIA	14	3	4	7	.975
LEPTOSPIROSIS	18	3	5	10	.733
FJUK	12	3	2	7	.680
SNAKE	7	0	5	1	.006
DRUGS	11	0	6	5	.063
CIRRHOSIS	8	4	0	4	.176
OTHERS	6	2	3	1	.250
TOTAL	151	36	41	74	

P<0.05 significant

The following is the results of the factors that were analysed in patients who underwent PD for AKI .

FACTORS INFLUENCING OUTCOME OF PATIENTS WITH A.K.I UNDERGOING PERITONEAL DIALYSIS

Total 151	death	Transfer to HD	Recover with PD	P value
NUMER IN EACH CATEGORY	36	41	74	
AGE AVERAGE	51	39.6	34	**.048**
MALES	25	28	55	.752
DM	18	7	5	**.029**
HT	15	8	11	.201
CCF	8	0	4	**.048**
HYPOVOLEMIA	5	16	45	.207
PULM . EDEMA	10	2	0	**.039**
MET ACIDOSIS	24	22	24	.624
SERUM K > 6	15	1	2	**.002**
CREATININE AVG	4.6	4.55	4.62	.657
URINE < 500	36	31	53	.135
AVERAGE URINE	157	389	468	**.046**
HYPERCATABOLIC	19	10	7	.087
COMA	19	1	1	**<.001**
JAUNDICE	22	12	28	.089
BILURUBIN >5	20	6	10	**.008**
OT/PT > 300	15	5	7	.046
UNRESPONSIVE HYPOTENSION	30	5	0	**<.001**
VENTILLATOR	22	1	0	**<.001**
DIC	14	5	1	**.046**
LOW PLT	18	6	8	**.026**
PERSIST HIGH K	17	7	1	**.035**
PERITONITIS	10	2	2	.402

FACTORS INFLUENCING OUTCOME OF PATIENTS WITH A.K.I DUE TO ACUTE DIARRHOEAL DISEASE UNDERGOING PERITONEAL DIALYSIS

ADD - 39	death	Transfer to HD	Recover with PD	P value
NUMER IN EACH CATEGORY	3	10	26	
AGE AVERAGE	65.3	32.9	34.5	**.023**
MALES	2	7	19	.230
DM	1	0	1	.143
HT	1	1	3	.534
HYPOVOLEMIA	1	4	20	.070
MET ACIDOSIS	3	5	6	.777
SERUM K > 6	3	1	0	**<.0001**
CREATININE AVG	5.0	5.3	5.1	.356
URINE < 500	3	8	26	.047
AVERAGE URINE	100	385	400	.021
HYPERCATABOLIC	1	1	0	.097
COMA	2	0	0	**.007**
UNRESPONSIVE HYPOTENSION	2	0	0	**.007**
VENTILLATOR	2	0	0	**.007**
PERSIST HIGH K	1	1	1	.170

FACTORS INFLUENCING OUTCOME OF PATIENTS WITH A.K.I DUE TO SEPSIS UNDERGOING PERITONEAL DIALYSIS

SEPSIS - 36	death	Transfer to HD	Recover with PD	P value
NUMER IN EACH CATEGORY	18	6	12	
AGE AVERAGE	52.4	44.3	35.8	**.031**
MALES	11	4	8	.167
DM	15	2	4	.043
HT	8	2	5	.079
CCF	7	0	4	.105
HYPOVOLEMIA	2	3	6	.169
PULM . EDEMA	7	1	0	**.040**
MET ACIDOSIS	12	5	6	.238
SERUM K > 6	2	0	0	.346
CREATININE AVG	3.6	4.4	4	.341
URINE < 500	16	4	7	.325
AVERAGE URINE	195	366	466	**.037**
HYPERCATABOLIC	10	2	3	.267
COMA	9	0	1	**.011**
JAUNDICE	10	2	3	.226
BILURUBIN >5	10	0	0	**.001**
OT/PT > 300	9	0	0	**.001**
UNRESPONSIVE HYPOTENSION	9	5	0	.247
VENTILLATOR	11	1	0	**.001**
DIC	10	1	0	**.001**
LOW PLT	11	0	0	**.001**
PERSIST HIGH K	8	2	0	**.027**
PERITONITIS	5	0	1	.307

FACTORS INFLUENCING OUTCOME OF PATIENTS WITH A.K.I DUE TO MALARIA UNDERGOING PERITONEAL DIALYSIS

MALARIA-14	death	Transfer to HD	Recover with PD	P value
NUMER IN EACH CATEGORY	3	4	7	
AGE AVERAGE	50	44.7	30.7	**.035**
MALES	2	2	6	.445
DM	2	1	0	.061
HT	2	0	0	**.013**
HYPOVOLEMIA	1	2	6	.223
MET ACIDOSIS	3	3	5	.588
CREATININE AVG	5.6	4.6	4.2	.659
URINE < 500	3	1	5	.563
AVERAGE URINE	66.6	575	486	**.003**
HYPERCATABOLIC	2	1	1	.452
COMA	2	0	0	**.015**
JAUNDICE	2	4	6	.438
BILURUBIN >5	2	2	2	.358
OT/PT > 300	2	1	2	.187
UNRESPONSIVE HYPOTENSION	2	0	0	**.015**
VENTILLATOR	2	0	0	**.015**
LOW PLT	2	1	5	.304
PERSIST HIGH K	2	2	0	**.050**

FACTORS INFLUENCING OUTCOME OF PATIENTS WITH A.K.I DUE TO LEPTOSPIROSIS UNDERGOING PERITONEAL DIALYSIS

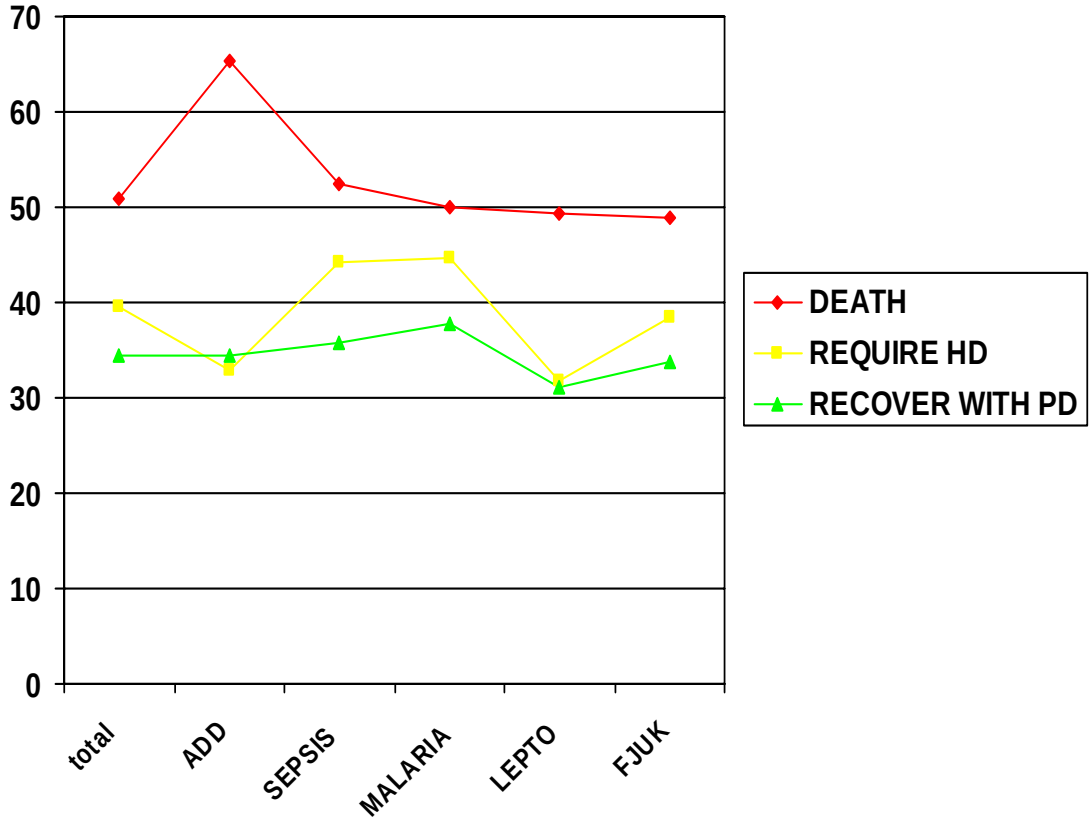
LEPTO 18	death	Transfer to HD	Recover with PD	
NUMER IN EACH CATEGORY	3	5	10	
AGE AVERAGE	49..3	31.8	31.2	**.041**
MALES	2	4	8	.305
DM	1	0	0	.087
HT	2	0	1	.124
HYPOVOLEMIA	0	2	7	.424
PULM . EDEMA	1	0	0	.232
MET ACIDOSIS	3	4	7	.380
CREATININE AVG	5.0	4.4	5.3	.235
URINE < 500	3	5	8	.081
AVERAGE URINE	100	370	440	**.032**
HYPERCATABOLIC	2	1	1	.432
COMA	1	1	0	.281
JAUNDICE	2	4	8	.305
BILURUBIN >5	2	2	3	.357
OT/PT > 300	2	1	2	.791
UNRESPONSIVE HYPOTENSION	2	0	0	**.003**
DIC	1	2	0	**.038**
LOW PLT	2	3	3	.244
PERSIST HIGH K	2	0	0	**.023**

CHARETERSTICS OF PATIENTS WITH SNAKE BITE AND AKI WHO UNDERWENT PERITONEAL DIALYSIS

Statistical analysis could not be done due to the small number (7) of patients in this group .

SNAKE-7	death	transferHD	recoverPD
NUMER IN EACH CATEGORY	0	5	1
AGE AVERAGE	0	36	45
MALES	0	5	1
CCF	0	0	0
HYPOVOLEMIA	0	3	1
PULM . EDEMA	0	0	0
MET ACIDOSIS	0	5	1
SERUM K > 6	0	0	0
CREATININE AVG	0	3.7	3.5
URINE < 500	0	3	0
AVERAGE URINE	0	370	1100
HYPERCATABOLIC	0	4	1
COMA	0	0	0
JAUNDICE	0	0	0
BILURUBIN >5	0	0	0
OT/PT > 300	0	1	0
UNRESPONSIVE HYPOTENSION	0	0	0
VENTILLATOR	0	0	0
DIC	0	2	1

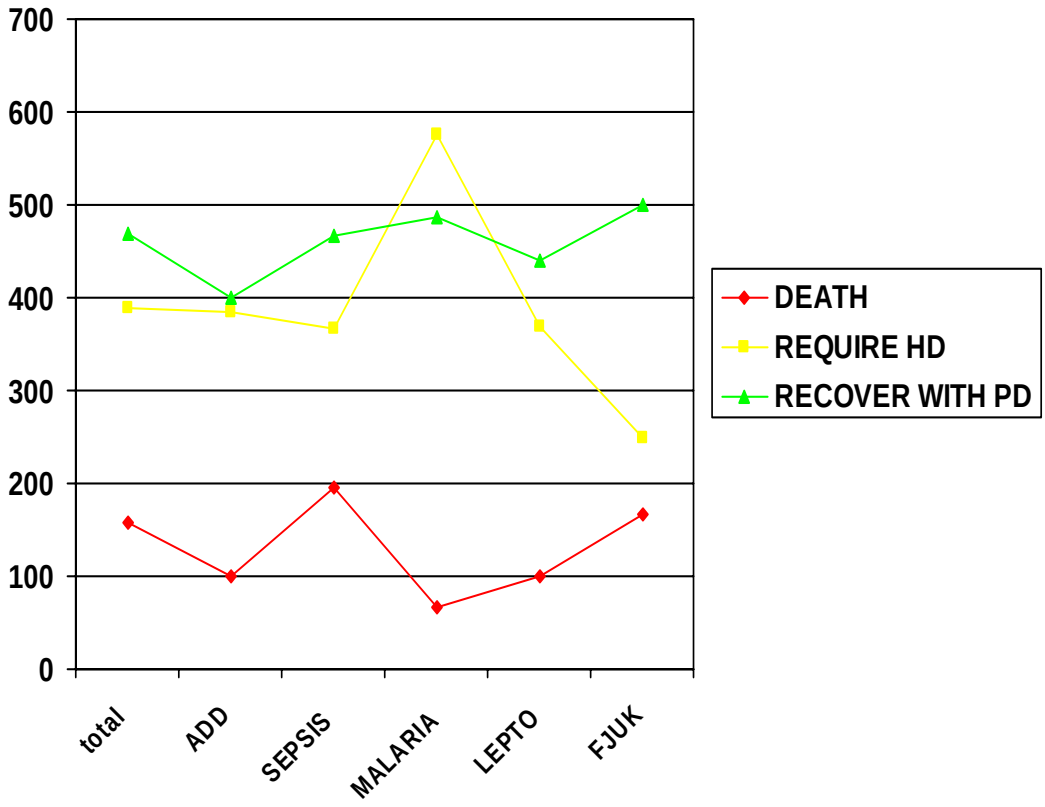
The age of patients was found to be an important determinant influencing outcome in patients with AKI undergoing PD . A pictoral representation of age of patients with the respective etiology of renal failure is depicted below .



Category of AKI – X axis

Average age in years in each group – Y axis

The average urine output of patients was also found to be an important determinant influencing outcome in these patients . A pictoral representation of average urine output of patients with the respective etiology of renal failure is depicted below.



Category of AKI – X axis

Average urine ouput /day in ml in each group – Y axis

DISCUSSION :

Peritoneal dialysis is an underutilized modality as a form of renal replacement therapy in the management of AKI and has certain advantages over intermittent HD – easy to perform , widely available , hemodynamically more stable than intermittent HD , absence of dialysis dyseqlibrium syndrome ,gradual correction of electrolyte abnormalities , obviates need for heparin and vascular puncture .
But the clearance of solutes is lesser than that obtained with intermittent HD . This nessecitates identifying the group of patients who will be most benefited from PD for AKI

This study reveals that peritoneal dialysis can be an effective modality of renal replacement therapy in acute renal failure in a subgroup of patients . Peritoneal dialysis has been found to be most useful in patients with AKI due to acute diarrhoeal disease .

Peritoneal dialysis was associated with a poorer outcome in patients with AKI due to sepsis . This should be due to the naturally poor outcome of patients with severe sepsis . Most of the patients with snake bite as a cause of renal failure eventually required hemodialysis for control of uremia / hyperkalemia and hence in this group of patients intermittent hemodialysis shoild be initiated early.

	PERCENTAGE OF PATIENTS WHO RECOVERED WITH PD
ADD	66.6%
SEPSIS	33.3%
MALARIA	50%
LEPTOSPIROSIS	55.5%
FJUK	58.3%
SNAKE	14.2%
DRUGS	45.5%
CIRRHOSIS	50%

Among patients with acute kidney injury who underwent peritoneal dialysis the following factors were found to be associated with poor outcome or a need to institute hemodialysis for renal replacement therapy .

1. elderly age . The average age of patients who expired while on PD was 51 yrs while the average age of patients who recovered with PD was 34 yrs .
2. presence of comorbid illness – especially diabetis mellitus . This may reflect the severity of illness among these patients and their increased propensity for developing hospital acquired infections .

3. presence of pulmonary edema and hyperkalemia(serum K >6 meq/L) . PD was initiated for these patients primary because of their other comorbid illness like hypotension and respiratory failure . The poor outcome with PD in this group of patients suggests that CRRT may be a better mode of renal replacement therapy in patients with hypotension and pulmonary edema.
4. low urine output . patients who recoverd with PD had an average urine output of 468 ml/day whereas those who had expired had a urine output of 157 ml/day .
5. hypotension unresponsive to pressor therapy and IV fluid replacement
6. evidence of other organ failure in association with renal failure as evidenced by – serum bilirubin >5 mg/dl , coma , respiratory failure requiring ventillatory support .
7. evidence of DIC

The factors that were not associated with a bad outcome with PD for patients with AKI were :

1. gender of patient
2. hypovolemia at initiation of PD . Patients with hypovolemia had a trend towards a better outcome with peritoneal dialysis – which could be because hypovolemia being a reversible factor significantly contributing to AKI . But the correlation was not statistically significant .

3. Metabolic acidosis at initiation of PD . A large group of our patients who underwent PD had acute diarrhoeal disease most of whom had metabolic acidosis – which was easily corrected by bicarbonate therapy .Acute diarrhoeal disease patients with AKI had a better prognosis than other group of patients .
4. Hypercatabolic renal failure . 52% patients who expired had hypercatabolism , 24 % patients who required HD and 10% patients who recovered with PD were hypercatabolic .But the p value was marginally insignificant (p = .08)
5. presence of jaundice or SGOT/SGPT > 100 was not significantly different between these groups , but severe jaundice with total bilirubin > 5 mg/dl was associated with bad outcome .
6. Peritonitis associated with PD. 10 of our patients developed peritonitis , but peritonitis was not significantly contributing to a poorer outcome .

Among patients with acute diarrhoeal illness causing AKI the following factors were associated with poor response to PD as mode of RRT :

1. elderly patients
2. serum K > 6 meq/L
3. coma
4. unresponsive hypotension
5. need for ventillatory support .

Among patients with sepsis causing AKI the following factors were associated with poor response to PD as mode of RRT :

1. elderly patients
2. presence of pulmonary edema
3. low urine output
4. serum bilirubin > 5 mg/dl
5. SGOT/SGPT > 300 IU/Dl
6. need for ventillatory support
7. evidence of DIC

Among patients with malaria /leptospirosis causing AKI the following factors were associated with poor response to PD as mode of RRT :

1.elderly patients
2.low urine output
3.coma
4.unresponsive hypotension
5.need for ventillatory support
6.evidence of DIC

CONCLUSION :

1. Peritoneal dialysis had been found to be an effective way of renal replacement therapy in patients with AKI due to diarrhoeal illness .
2. Patients with snake bite or sepsis as cause of AKI eventually required hemodialysis or expired due to their illness and hence intermittent HD or CRRT should be considered in these patients .
3. PD can be an effective way of RRT in patients with AKI who are
   relatively younger ,
   do not have comorbid illness like DM ,
   absence of pulmonary edema or hyperkalemia ,
   absence of other organ dysfunction
   (bilirubin > 5 mg /dl ,coma or respiratory failure) and in absence of DIC .

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